

REMARKS

The Official Action mailed July 22, 2010, has been received and its contents carefully noted. This response is filed within three months of the mailing date of the Official Action and therefore is believed to be timely without extension of time. Accordingly, the Applicant respectfully submits that this response is being timely filed.

The Applicant notes with appreciation the consideration of the Information Disclosure Statements filed on April 16, 2007; June 14, 2007; and March 1, 2010.

Claims 1, 3, 11, 18, 26, 28, 32, 34, 37, 39, 42, 44, 45, 47, 50, 52, 53, 55, 58, 60, 69, 71, 74, 76, 77, 79 and 82 were pending in the present application prior to the above amendment. Claims 1, 3, 11, 26, 28, 37, 39, 42, 44, 45, 47, 50, 52, 69, 71, 74, 76, 77, 79 and 82 have been amended to better recite the features of the present invention, and new claims 86-89 have been added to recite additional protection to which the Applicant is entitled. Accordingly, claims 1, 3, 11, 18, 26, 28, 32, 34, 37, 39, 42, 44, 45, 47, 50, 52, 53, 55, 58, 60, 69, 71, 74, 76, 77, 79, 82 and 86-89 are now pending in the present application, of which claims 1, 3, 26 and 28 are independent. For the reasons set forth in detail below, all claims are believed to be in condition for allowance. Favorable reconsideration is requested.

Paragraph 4 objects to claim 11 asserting that "[t]o avoid confusion between the 'approximate line' determined from 'average values of corrected saturations' (claim 1) and the 'approximate line' determined from 'average values of luminances' (claim 11), in claim 11, line 5, 'obtaining an approximate line' should be something similar to --- obtaining a second approximate line--- and in claim 11, line 8, 'the approximate line' should be something similar to ---the second approximate line---" (page 3, Paper No. 20100719). In response, claim 11 has been amended in accordance with the Examiner's suggestions. Accordingly, reconsideration and withdrawal of the objections are in order and respectfully requested.

Paragraph 6 of the Official Action rejects claims 1, 3, 11, 18, 26, 28, 32, 34, 37, 39, 42, 44, 45, 47, 50, 52, 53, 55, 58, 60, 69, 71, 74, 76, 77, 79 and 82 under 35 U.S.C.

§ 112, second paragraph, asserting that the claims are "indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention" (*Id.*).

Regarding claims 1, 3, 26 and 28, the Official Action asserts that the claims are "vague and indefinite because [the claims refer] to 'a demanded performance of the semiconductor element' while there is no previous mention of any 'semiconductor element'" (page 4, *Id.*). In response, the claims have been amended to recite "a semiconductor element that would comprise the semiconductor film."

Regarding claims 37, 39, 42, 44, 45, 47, 50 and 52, the Official Action asserts that the claims are "vague and indefinite because [the claims attempt] to further limit parent claim 1 'wherein the visible light is irradiated from a light source selected from the group...' and that the claims are "vague and indefinite because [the claims attempt] to further limit parent claim 1 'wherein an illumination intensity of the visible light irradiating on a surface of the semiconductor film is 10,000 lux or more' ... however, [the claims specify] 'irradiating an energy beam' and not 'visible light' making it unclear to one having ordinary skill in the art whether or not the 'visible light' is the same as the 'energy beam'" (pages 4-5, *Id.*). The Applicant notes that the above-referenced feature is in fact directed to the "visible light" of the "visible light dark field photograph." Accordingly, for clarification, the claims have been amended to recite that "the visible light used for taking the dark field photograph of the semiconductor film is irradiated" or "the visible light used for taking the dark field photograph of the semiconductor film is 10,000 lux or more," as appropriate.

Regarding claims 77, 79 and 82, the Official Action asserts that the claims are "vague and indefinite because [the claims attempt] to further limit parent claim 1 'wherein a means for photographing the scattered light is provided in a crystallization chamber' while there is no previous mention of any 'scattered light' making it unclear to one having ordinary skill in the art as to what 'the scattered light' refers" (page 5, *Id.*). In

response, the claims have been amended to recite "a means for taking the visible light dark field photograph of the semiconductor film."

The Applicant respectfully submits that the amended claims particularly point out and distinctly claim the subject matter which applicant regards as the invention and are definite. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 112 are in order and respectfully requested.

Paragraph 8 of the Official Action rejects claims 3, 34, 39, 71 and 79 as obvious based on the combination of U.S. Publication No. 2003/0016349 to Tsumura, U.S. Publication No. 2002/0031249 to Komuro and U.S. Publication No. 2005/0041226 to Tanaka. Paragraph 9 of the Official Action rejects claims 1, 11, 18, 32, 37, 69, and 77 as obvious based on the combination of Tsumura, Komuro, Tanaka and U.S. Publication No. 2004/0228526 to Lin. Paragraph 10 of the Official Action rejects claims 47 and 55 as obvious based on the combination of Tsumura, Komuro, Tanaka and U.S. Publication No. 2003/0142298 to Ujihara. Paragraph 11 of the Official Action rejects claims 45 and 53 as obvious based on the combination of Tsumura, Komuro, Tanaka, Lin and Ujihara. Paragraph 12 of the Official Action rejects claims 28, 44 and 76 as obvious based on the combination of Tsumura, Komuro, Tanaka and U.S. Patent No. 6,861,614 to Tanabe. Paragraph 13 of the Official Action rejects claims 26, 42, 74 and 82 as obvious based on the combination of Tsumura, Komuro, Tanaka, Lin and Tanabe. Paragraph 14 of the Official Action rejects claims 52 and 60 as obvious based on the combination of Tsumura, Komuro, Tanaka, Tanabe and Ujihara. Paragraph 15 of the Official Action rejects claims 50 and 58 as obvious based on the combination of Tsumura, Komuro, Tanaka, Lin, Tanabe and Ujihara. The Applicant respectfully traverses the rejection because the Official Action has not made a *prima facie* case of obviousness.

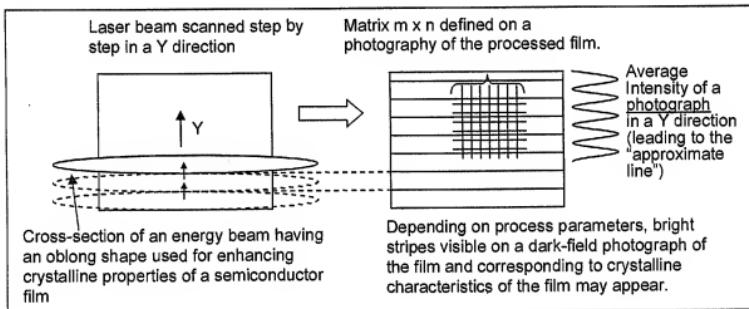
As stated in MPEP §§ 2142-2144.04, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some reason, either in the references themselves or in the knowledge generally available to one of ordinary

skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some reason to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims, as amended. Independent claims 1, 3, 26 and 28 have been amended to recite that a direction in which the energy beam is scanned is a Y direction, and a direction perpendicular to the Y direction is an X direction in the digital image; defining basic units comprising m rows and n columns by dividing the digital image into the n columns in the X direction and the m rows in the Y direction in a predetermined analysis range in the digital image; calculating average values of corrected saturations (or luminances) of n basic units aligned in the X direction per the m rows aligned in the Y direction; obtaining an approximate line from relations between positions in the Y direction and the average values of corrected saturations (or luminances) corresponding to the positions in the Y direction; and comparing a fluctuation obtained from relations between the approximate line and the average values of corrected saturations (or luminances) with a reference value which is determined for a demanded performance of a semiconductor element that would comprise the semiconductor film, in order to evaluate the crystallinity of the semiconductor film having the crystallinity that has been improved. For the reasons

provided below, Tsumura, Komuro, Tanaka, Lin, Ujihara and Tanabe, either alone or in combination, do not teach or suggest the above-referenced features of the present invention.

The Applicant respectfully submits that the opinions expressed in the Official Action appear to be the result of confusion between an energy beam used to improve crystallinity and a light used for taking a dark-field photograph. Provided below is one example of a principle of the present invention applied to a particular case of checking crystallinity of a semiconductor film after laser beam treatment to improve its crystallinity.



One key point of the present invention is that the present invention allows evaluation of crystalline characteristics of a semiconductor film in a very rapid and efficient way by (i) taking a simple dark-field photograph of a surface of a processed film (no scanning is necessary, an image of a surface of the film is almost instantaneously obtained, as in traditional photography) and (ii) performing a rather simple analysis of the photograph to check, for example, the presence of stripes perpendicular to the scanning direction Y of the laser used to process the film. The fluctuations of luminosity along the Y direction (studied through the "approximate line" method as noted in the present specification) reveal the presence of bright stripes. Please note that this

method does not require any specific light wavelength nor any specific incident angle of illumination (as illustrated in Figure 1 by the use of ring lighting that can be tilted at will).

The Applicant respectfully submits that the invention as described above is neither disclosed by nor obvious over the cited references, either alone or in combination. Further, the Applicant believes that the current claims are sufficient to distinguish the present invention over the prior art, which require, for example, using a plurality of precise wavelengths such as in Tsumura, or determining a precise angle such as in Komuro, as explained below.

The method of the present invention is particularly adapted to detect a crystalline quality of a semiconductor film having been submitted to a laser treatment leading to the appearance of bright stripes (visible in a dark-field photograph) in a specific direction, the X direction as defined and recited in the claims: "a direction in which the energy beam is scanned is a Y direction, and a direction perpendicular to the Y direction is an X direction in the digital image." For this reason, the basic $m \times n$ units definition and subsequent image analysis are performed in accordance with this specific direction. Please note that this allows for simplified image analysis, thus fast assessment of the quality of the film.

On the other hand, Tsumura discloses a method used to detect what seems to be random patterns (see Figure 10). As such, Tsumura's method cannot use the simplified analysis described in the claims, in particular, since no specific direction seems to be present in the films studied by Tsumura. Therefore, the Applicant respectfully submits that Tsumura is not applicable to the method recited in the present claims.

Further, the Official Action asserts that "the invention of Tsumura and Komuro does teach calculating average values of the luminance corresponding to the positions in the Y direction of a surface scanned by an energy beam" (page 9, Paper No. 20100719). The Applicant respectfully disagrees and traverses the assertions in the Official Action. The "energy beam," as recited in the present claims, is specifically an

energy beam used for processing the semiconductor film, i.e., "the semiconductor film having a crystallinity that has been improved by irradiating an energy beam." The "energy beam" recited in either Komuro or Tanaka is an energy beam used to perform measurement on the semiconductor film. The Applicant respectfully submits that a further combination with one or more of Tsumura, Lin, Ujihara and Tanabe does not cure the above-referenced deficiencies in Komura or Tanaka. In addition, for the same reason, a hypothetical combination with Tanaka does not cure the deficiencies of Tsumura and Komuro regarding performing a measurement in a direction perpendicular to the scanning direction of the energy beam.

Still further, the Applicant respectfully submits that the features of obtaining an approximate line from relations between positions in the Y direction and the average values of corrected saturations (or luminance, depending on the claims) corresponding to the positions in the Y direction are not, in fact, taught by Komuro. Komuro teaches obtaining graphs expressing luminance of diffracted light as a function of an angle of incidence of said light on a surface (see, e.g., Figure 4, or lines 8-10 of the abstract). In contrast, the present claims recite calculating average values of luminances of n basic units aligned in the X direction per the m rows aligned in the Y direction; obtaining an approximate line from relations between positions in the Y direction and the average values of luminances corresponding to the positions in the Y direction, where the X and Y directions are defined on a plane digital image. The Applicant respectfully submits that, considering the differences between the teachings of Komuro and the features of the present claims, it is unreasonable to consider the present claims as obvious over Komuro, either alone or in combination with one or more of Tsumura, Tanaka, Lin, Ujihara and Tanabe.

Therefore, the Applicant respectfully submits that Tsumura, Komuro, Tanaka, Lin, Ujihara and Tanabe, either alone or in combination, do not teach or suggest the above-referenced features of the independent claims.

Since Tsumura, Komuro, Tanaka, Lin, Ujihara and Tanabe do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

At this opportunity, claims 1, 3, 26 and 28 have been amended to recite "defining basic units comprising m rows and n columns by dividing" Also, claims 69, 71, 74 and 76 have been amended for clarity.

New dependent claims 86-89 have been added to recite additional protection to which the Applicant is entitled. Claims 86-69 recite that "the visible light used for taking the dark field photograph of the semiconductor film is of an arbitrary wavelength provided it is visible." That is, no specific wavelength is required to practice the present invention. For the reasons stated above and already of record, the Applicant respectfully submits that new claims 86-89 are in condition for allowance.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized to charge fees under 37 C.F.R. §§ 1.16, 1.17, 1.20(a), 1.20(b), 1.20(c), and 1.20(d) (except the Issue Fee) which may be required now or hereafter, or credit any overpayment to Deposit Account No. 50-2280.

Respectfully submitted,



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